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UTILITY

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(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	20530/11
First Inventor	Tim W. Bray, et al.
Title	METHOD FOR DESCRIBING OBJECTS IN A VIRTUAL SPACE
Express Mail Label No.	EM217281257US

jc849 U.S. PRO 09/712544 11/14/00

ADDRESS TO: **Assistant Commissioner for Patents**
Box Patent Application
Washington DC 20231

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ *Fee Transmittal Form (e.g. PTO/SB/17)
(Submit an original and a duplicate for fee processing)

2. ☒ Applicant claims small entity status. (See 37 CRF 1.27)

3. ☒ Specification Total Pages (25)
(preferred arrangement set forth below)
- Descriptive title of the invention
- Cross References to Related Applications
-Statement Regarding Fed sponsored R & D
-Reference to Microfiche Appendix
-Background of the Invention
-Brief Summary of the Invention
-Brief Description of the Drawings (if filed)
-Detailed Description
-Claim(s)
-Abstract of the Disclosure

4. ☒ Informal Drawing(s) (35 U.S.C. 113) Total Sheets (14)

5. ☒ Oath or Declaration
a. ☒ Newly executed (original or copy)
b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

6. ☐ Application Data Sheet. See 37 CFR 1.76

7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)

8. Nucleotide and/or Amino Acid Sequence Submission
(If applicable, all necessary)
a. ☐ Computer Readable Copy
b. Specification Sequence Listing on:
i. ☐ CD-ROM or CD-R (2 copies); or
ii. ☐ Paper
c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. ☐ Assignment Papers (cover sheet & document(s))
10. ☐ 37 C.F.R. § 3.73(b) Statement ☒ Power of Attorney (when there is an assignee)
11. ☐ English Translation Document (if applicable)
12. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
13. ☐ Preliminary Amendment
14. ☐ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
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(if foreign priority is claimed)
16. ☐ Other: _____

17. **If a CONTINUING APPLICATION**, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheets under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application no.: _____

Prior application information: Examiner: _____ Group / Art Unit: _____

For CONTINUATION or DIVISIONAL only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

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Signature			Date	**November 14, 2000**	

UTILITY PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Tim W. Bray, et al.

Title : METHOD FOR DESCRIBING OBJECTS IN A VIRTUAL SPACE

Docket No : 20530/11

CERTIFICATE OF EXPRESS MAIL

EXPRESS MAIL Mailing Label Number: EM217281257US
Date of Deposit: November 14, 2000

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Paper(s) Enclosed:

- ☒ Transmittal Cover Sheet AND Fee Transmittal
- ☒ Check for $418.00
- ☒ Specification 20 page(s)
- ☒ Claims 4 page(s)
- ☒ Abstract 1 page(s)
- ☒ Drawings 14 page(s) INFORMAL
- ☒ Declaration 2 page(s)
- ☒ Power of Attorney 2 page(s)
- ☒ Express Mail Certificate No. EM217281257US
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FEE TRANSMITTAL for FY 2001

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT ($) 418.00

Complete if Known	
Application Number	
Filing Date	Herewith
First Named Inventor	Tim W. Bray
Examiner Name	
Group Art Unit	
Attorney Docket No.	20530/11

Jc822 U.S. PTO 09/712544 11/14/00

METHOD OF PAYMENT

1. [X] The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:
   - Deposit Account Number: 15-0627
   - Deposit Account Name: Oppenheimer Wolff & Donnelly, LLP
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   - [X] Applicant claims small entity status. See 37 CFR 1.27
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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	710	201	355	Utility filing fee	355
106	320	206	160	Design filing fee	
107	490	207	245	Plant filing fee	
108	710	208	355	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 355.00

2. EXTRA CLAIM FEES

		Extra Claims		Fee from below	Fee Paid
Total Claims	27	-20** = 7	X	9	= 63
Independent Claims	3	- 3** = 0	X	0	= 0
Multiple Dependent				—	= 0

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	80	202	40	Independent claims in excess of 3
104	270	204	135	Multiple dependent claim, if not paid
109	80	209	40	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 63.00

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for *ex parte* reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	390	216	195	Extension for reply within second month	
117	890	217	445	Extension for reply within third month	
118	1,390	218	695	Extension for reply within fourth month	
128	1,890	228	945	Extension for reply within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,240	241	620	Petition to revive - unintentional	
142	1,240	242	620	Utility issue fee (or reissue)	
143	440	243	220	Design issue fee	
144	600	244	300	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	710	246	355	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	710	249	355	For each additional invention to be examined (37 CFR § 1.129(b))	
179	710	279	355	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	

Other fee (specify) _____

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SUBMITTED BY				Complete (if applicable)	
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PATENT APPLICATION

OF

TIM W. BRAY & DAVID G. ASHWORTH

FOR

UNITED STATES PATENT

ON

METHOD FOR DESCRIBING OBJECTS IN A VIRTUAL SPACE

Express Mail Label No. EV 325 145 525 US

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Attorney Docket #: 20530-11
Number of Drawings: 14

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METHOD FOR DESCRIBING OBJECTS IN A VIRTUAL SPACE

PRIORITY CLAIM AND CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of: U.S. Provisional Application No. XX/XXX,XXX, filed September XX, 2000, entitled "System and Method for Network Information Visualization"; and U.S. Provisional Application No. XX/XXX,XXX filed September XX, 2000, entitled "System and Method for Describing Objects in a Virtual Space." The contents of both provisional applications are incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates to virtual spaces and particularly to using a protocol to describe a series of objects onto such a virtual space.

A virtual space consists of a surface with rectangular bounds and the area above the surface. This is very much like a landscape or topography in the real world. Virtual spaces can contain data objects spread across the surface, much in the same way that buildings, roads, and other real-world objects are arrayed on the surface of our world. Just as buildings in the real world can be grouped hierarchically into neighborhoods, cities, or nations, objects in a virtual space can be grouped into hierarchical categories.

Many types of hierarchical objects can be placed in a virtual space. The co-pending application, Serial No. XX/XXX,XXX, filed on November XX, 2000, entitled "System and Method for Network Information Visualization," which is incorporated herein by reference, describes one use for such objects in a virtual space. In that application, a virtual space of URL objects from the Internet is described. In such a system, URLs objects are placed in the virtual space according to categories, such as MUSIC, COMPUTERS, POLITICS, etc. Using the system described (which includes a database, a web server, and a browser), a user connected to the Internet can view and navigate through a 2D map or a 3D map of the virtual space to locate desired URLs. Other categorized virtual spaces could contain a manufacturers' product catalog or a library's card catalog. Or, the virtual space could be used within a geographic information system or a multi-user computer game, for example.

Although applications running on a single computer have not needed a visualization protocol, client/server applications requires the use of some type of visualization protocol. In such a system, a server stores information about the objects in the virtual space on a database and transmits a description of the virtual space over a network (such as the Internet) to client computers. In the past, such client/server computer applications have had disadvantages. The protocols have not been compact and have not made efficient use of network bandwidth. Usually, protocols have consisted of large messages to the client describing all of the details of how to draw a current map portion of the virtual space. One such example of this is VRML (virtual reality markup language). Although such protocols do well in describing the landscape, they use far too much bandwidth. In addition, protocols that enforce a particular visualization severely limit the client application. Such a client cannot alter the presentation of the information to suit the need of different types of user groups. In order to present the information in a different way, both the client and the server must be modified.

Some protocols have had the disadvantage of being closed, proprietary protocols. Although some manufacturers claim that such a closed system best protects their market interests, open source applications, such as Linux, have recently shown that open source applications help to encourage further enhancements and industry adoption of standards.

As with many elements of the Internet, past protocols have acted as though everyone on the Internet speaks English. Non-English speakers have had troubles working with other protocols that do not support other languages. And even English speakers have not been able to easily use past protocols because the protocols have not readily described the categories or other hierarchical principles of the objects and the metadata associated with the objects.

What is needed is an easy-to-use protocol for describing objects in a virtual space. Such a protocol should be extensible, well suited to web-enabled client/server systems, and capable of supporting multiple languages.

SUMMARY OF THE INVENTION

This invention can be regarded as a method and protocol for describing a series of objects mapped onto a virtual space. The method includes the steps of listing metadata for each of the

objects and expressing a position within a virtual world for each of the objects to be visualized. The position with the virtual world may be described with an <x,z> coordinate set. For a system which visualizes website information, metadata can include the title of the object, a description, a count of the number of pages within the website object, a count of the number of links pointing either from or to the object, a rating for the website object, etc. The metadata is of course different for other types of hierarchical objects. In addition to describing the objects to be visualized, the method may include describing the locations of one or more categories to with the objects have been assigned.

The present invention differs in many crucial respects from prior work in this field, and the cumulative effect of these innovations is a dramatically improvement in the transfer of visualization data over a network. Some of the advantageous characteristics of the present invention are:

1. The protocol is a compact variable-size textual format that is designed for easy parsing.

2. The protocol is a stable, open, highly interoperable Internet standard.

3. The protocol supports the use of all international character sets.

4. The protocol responses contain only facts, labels, and metadata, no particular graphical rendition on the client software is described.

5. The protocol has built-in support for object location, metadata delivery, and category information.

6. The protocol is well suited for Web deployment since it is built on a base consisting of HTTP, XML, and URLs.

7. The protocol's use of XML Namespaces, it is extensible and so can be used by many different applications.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and its features and advantages, reference is made to the following description taken in conjunction with accompanying drawings, in which:

Figure 3 is a example of a hierarchical directory of objects.

Figure 4 is a block diagram of one embodiment of a runtime subsystem employing a protocol in accordance with the present invention.

Figure 6B is a simplified view of a three-dimensional map that can be described by one embodiment of the present invention.

Figures 11A through 11G present a flow chart for one embodiment of a map server module in accordance with the present invention.

Figures 12A through 12C present a flow chart for one embodiment of a 3D Browser Plug-in, in accordance with the present invention.

Figure 13 presents an illustration of the use of HTTP, URL, and the XYZ Protocol to communicate between the client and the server.

The Figures are not numbered sequentially in this patent application because the Figures are duplicates of Figures in the co-pending application, Serial No. XX/XXX,XXX, filed on November XX, 2000, entitled "System and Method for Network Information Visualization."

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention is a method for describing objects in a virtual space. Throughout the drawings, an attempt has been made to label corresponding elements with the same reference numbers. The reference numbers include:

Reference Number	Description
110	runtime database
115	runtime subsystem

150	map serving software
155	web server
160	network
165	web browser
170	3D browser plug-in
175	host computer
180	client computer
605	visualization of object
610	visualization of category
615	visualization of metadata
1101 – 1192	steps of flowcharts in Figures 11A through 11G
1205 – 1266	steps of flowcharts in Figures 12A through 12C

In one embodiment of the present invention, objects in a virtual space are described using XML, a data format for structured document interchange over the web. Unlike HTML, XML is designed to organize information, rather than merely to display it. This structured information contains both content and some indication of what the content means. Basically while HTML is a predefined markup language whose purpose is displaying information, XML is a customized meta-language whose purpose is describing the content of data objects.

In one embodiment of the present invention, a computer system having several modules is configured to use the protocol to provide a visualization of an information network made up of categories and sites. For example, the system can visualize web sites on the Internet by category. Such a visualization provides a map to the user in which each web site is a location within a category, which itself may be a subcategory of another category. In one embodiment, the websites and categories are from the Open Directory (ODP) database of web sites organized by categories (see <dmoz.org>). Another example of an information network ripe for visualization is a computer file system that is organized into Directories and Files. A Directory/File grouping is analogous to a Category/Site grouping. Throughout this explanation, the category/site visualization will be described. One skilled in the art will understand that such a system can be configured to visualize directory/file and many other types of hierarchical information spaces.

I. Mapping Terminology

Three formats are used to describe a point or a region within the 2D map or the 3D virtual world: XZ-coordinate sets, XYZ-coordinate sets, and XZWD-coordinate sets. An XZ-coordinate set

describes a unique location on a two-dimensional map, where the units are in meters. The X-axis of the map increases from left to right while the Z-axis of the map increases from back to front. For example, the coordinate set (50, 1200) describes a location that is 50 meters from the left edge of the world and 1200 meters from the back edge of the world. An XYZ-coordinate set describes a unique location in a three-dimensional space, where the Y-axis of the space increases from bottom to top. Thus, the coordinate set (50, 1200, 300) describes a location that is 50 meters from the left edge of the space, 1200 meters above the surface of the space and 300 meters from the bottom of the space.

An XZWD-coordinate set describes a rectangular polygon region on the surface of the space where W represents the width of the rectangle and D represents its depth. For example, the (1200, 1400, 300, 130) coordinate set represents a rectangle whose back left corner is at 1200 meters from the left of the landscape, 1400 meters from the back of the landscape, and which is 300 meters in width and 130 meters in depth.

II. Overview of the Visualization System

In one embodiment of the present invention, the Internet is visualized for users of the system as either a 2D map or as a 3D virtual world. Web sites on the Internet are assigned to categories. The categories are hierarchical, so each category can be a parent category having zero or more child subcategories. For example, an ART category can have subcategories of MUSIC and MOVIES. The MUSIC category can have the further subcategories of LYRICS and STYLES.

The computer system maps these categories and web sites to a map region. Each web site is assigned a (x,z) coordinate set which places it at an exact location within the map region. Each category is assigned an area, which is a polygon region within the map region. In one embodiment, the polygon regions are rectangles along the surface of the map region. The rectangles are defined by a (x,z,w,d) coordinate set (where x and z are points along the x-axis and the z-axis, w is a width measurement, and d is a depth measurement).

A segment of the categorized directory of the Internet is presented to the user by displaying each of the categories' polygon regions on the map region. In one embodiment, each polygon region is displayed as a different color to assist the user in differentiating among the categories. In one

embodiment, a real region on the Earth is used as the basis for the map region. For example, in one embodiment, the continent of Antarctica is used as the map region and a directory of websites is visualized as locations in Antarctica.

A graphic is displayed for each of the web sites within each of the categories. In a 3D visualization, the graphic may be shown as a type of a building. The graphic that is displayed can be dependent upon a value of one or more metadata items associated with the web site. For example, the better of a review that a web site receives from an editor perhaps the bigger the building is displayed. To further differentiate web sites' graphics on the map region, in one embodiment of the system, the web sites within a category are assigned a visibility rank, where, based on some criteria, the "best" web sites are the most visible. Other metadata for the web sites can also be displayed, either as a permanent part of the visualization, or only upon a specific action (such as the user mousing over the web site's graphic).

In the 3D visualization, a metaphor of a world or city can be used. As already explained, in some embodiments, a real area of the world can be used as the map region, to which the hierarchical objects can be mapped. Each category area can be seen as a neighborhood within a city, and each web site's graphic can seem to be a building within a city. To aid in navigation among the categories, virtual roads can be presented between the category areas.

III. Runtime Database 110

One embodiment of a system utilizing the present invention is shown in Figure 4. At the heart of such a system is the runtime database 110, which stores the information space being visualized, such as an information network made up of categories and sites, such as shown in Figure 3.

Categories are organized into a hierarchy, i.e., each category has a single parent category and can have zero or more subcategories or child categories. Categories at the top of a hierarchy are special cases in that they do not have a parent. These are called top-level categories. The system can handle an arbitrary number of categories, top-level categories, subcategories, and hierarchy depth. Figure 3 shows categories as rectangles. Thus, ARTS, MUSIC, and MOVIES

as three of the seven categories. Notice that MUSIC is a child subcategory to ARTS but is a parent category to LYRICS and STYLES.

As well as subcategories, each category can contain zero or more sites (i.e., website). In Figure 3, sites are shown by numbered circles. Thus, circle 1 is a site associated to the ARTS category. The site could be, for example, <www.walkerart.org>. A site can appear in one or more categories. A site has attributes that are stored in the database such as: title, description, URL, map location, and metadata. Two of the site attributes are key to the function of the system. The first is map location. Each category/site pair is given a unique (x,z) coordinate set locating it on a two-dimensional map.

The second key class of site attributes is metadata. Examples of metadata are: size, in-link count, and out-link count. Site metadata is collected and calculated. Metadata is communicated to a user through the visualization. For example, the size of the graphic can very based on the website's visibility rating.

IV. Runtime Subsystem 115

The runtime subsystem 115, which provides visualization services to users, shown in Figure 4, consists of a host computer 175 and a client computer 180. The host computer 175 is preferably a commercial Intel PC running the Linux operating system with 1 gigabyte of RAM memory. The runtime subsystem 115 is designed to be scalable and fault tolerant through server replication. In one embodiment, the host computer 175 of the runtime subsystem 115 contains the web server 155 and the map serving software 150 (which responds to queries from visualization clients).

1. The Host Computer 175

A. Web Server 155

One embodiment of the system uses the Apache web server software. This is a robust, commercial-grade, feature-rich, and freely available source code implementation of an http web server. Information on the Apache web server is available at <www.apache.org>.

B. Map Serving Software 150

In one embodiment of the system, the map serving software 150 is an Apache module that responds to queries from the visualization clients 180. The queries are formed using the protocol of the present invention. The server satisfies the queries by extracting the requested data from the runtime database 110. The map serving software 150 has been configured in one embodiment to support the following interfaces, among others:

Interface	Description
/category	Retrieve map information by category
/xzwd	Retrieve map information by area rectangle

(1) Map Server Processing 150

Figures 11A through 11G describe the functional processing of one embodiment of the map server. Referring to Figure 11A, the map server parses the URL's parameters from a request (steps 1102) and responds according to which of the seven types of interfaces is involved.

If the request is for a category, then the map server 150 sets x, z, w, and d to the category's coordinates. If 3D output is supported, XML is output for all of the categories (and subcategories) within <x, z, w, d> and then outputs all of the sites within this space (steps 1121 and 1122). Otherwise, if 2D output is required, the x,z,w,d location is centered in the display window (step 1176 of Figure 11G), and all of the sites and categories within this region are retrieved (step 1178). Categories that are too far below the parent category are eliminated (step 1180) as well as sites that fall outside of the parent category area (step 1182). The categories are alphabetically sorted (1184) and they are assigned each a different color (step 1186) before being displayed through HTML, etc.(steps 1188, 1190, 1192).

If the /xzwd handler is invoked, the map server 150 determines which parent category is the best to display (step 1124) and then outputs the proper information in either 3D or 2D. A /chat request causes the map server to launch a chat client for the respective category (step 1116). With a /teleport request, an HTML listing is produced listing the hyperlinks for each top-level Category (step 1164) or for each subcategory within a specific category (steps 1168-1174). The

hyperlinks listing for allowing teleport navigation is then output (step 1166) to allow the user to jump (i.e., teleport) to any of the listed categories.

If a /search request is made to the map server software 150, the search string is first parsed into the string's component words (step 1132). The category word index is searched to determine whether any direct matches exist (step 1134). Then the site word index is searched to determine whether any direct matches exist for sites (step 1136). If direct matches were found, they are output to the user (step 1140 or step 1148), otherwise partial matches are returned (steps 1154 – 1160, 1150, 1152, 1142, 1144).

2. The Client Computer 180

The host computer 175 serves information that is requested by various client computers 180 via a computer network 160 such as the Internet's IP network. To access the information from the host computer 175, users with client computers 180 connected to the Internet must have a web browser 165. To process requests and responses that using the protocol of the present invention, the client computer 180 must also have a 3D plug-in 170.

A. Web browser 165

The system is compatible with current web browsers such as Microsoft's Internet Explorer and Netscape's Communicator. Such web browsers provide the user with a two-dimensional visualization of the information space. If the optional 3D plug-in 170 is present, the browser 165 can provide a 3D image.

B. 3D Browser Plug-In 170

The 3d browser plug-in software 170 provides a three-dimensional visualization of the runtime database 110. In such a 3D configuration, a virtual world comprising ground and sky, and in which the websites are represented as buildings can be rendered.

The graphical elements are used to convey metadata information to the user creating a semantically rich landscape. Examples of such graphical elements include: building architecture, size, color, and adornments. Text is used as well to convey information. For example, a text window can be displayed when a user mouses-over a building.

The 3d browser plug-in 170 enables a user to move explore the information landscape by moving around and changing the viewpoint. Integration of the plug-in 170 with html in the browser 165 enables the user to control the visualization with functions such as zoom and teleport.

Figures 12A, 12B, and 12C describe the functionality of one embodiment of the 3D browser plug-in 170. Once the plug-in is initialized (step 1205), the first xzwd is requested from the server (step 1222) and the server answers with an XML response (step 1222). Each XML element of the response is parsed as a category (step 1224), an ad (1227), or a site (1229). The main loop of the 3D browser plug-in 170 involves sensing navigation (step 1254) or mousing (1258) actions. If navigation requires more of the virtual world to be displayed, then the display is updated to reflect the new position (steps 1264 and 1266).

V. The XYZ Protocol for Describing Objects

The present invention, which can be called the "XYZ Protocol" is used as a protocol for describing the objects to be visualized. Although the method of the present invention could be implemented in various ways, one method of implementation is to create a series of XML tags. In such an embodiment, the XYZ Protocol is based on top of HTTP and URL. Thus the XYZ Protocol is well suited for Internet-based applications.

The XYZ Protocol is very appropriate for traversing virtual spaces because rather than delivering to the client lengthy instructions on how to render the objects, the Protocol instead delivers only the coordinates for the object and metadata about the object. The client is free to be configured to render the objects as desired. Thus, a single server using the XYZ Protocol to deliver responses describing a set of objects in a virtual space can be simultaneously leveraged by different types of clients. For example, some clients could be configured to depict the objects for school-age users. In such a system, perhaps the web-site objects are shown as different cartoon characters. Other clients could be configured to depict the objects for adults. In this system, the web-site objects can be shown as a city made up of different types and sizes of buildings. New clients with new rendering approaches can be developed without needing to change the server.

The XYZ Protocol is very flexible because by the very nature of XML, new tags can be created and added to the Protocol as necessary. The Protocol is also desirable because it is compact and conserves bandwidth during transmission over protocols (such as VRML) that transmit physical details of the objects to be visualized rather than allowing the client to off-load the rendering process. Since the client undertakes the rendering, the server can handle a large number of users concurrently, sending only facts, labels and metadata in response to the various requests.

The network information visualization system depicted in Figure 4 can operate using the XYZ Protocol of the present invention. Figure 13 shows a simplified version of the system of Figure 4 with the flow of information shown by dashed lines. In such a system, a user uses a web-browser 165 to view a map of the virtual world. The user may cause a request to be constructed by entering a search term, selecting an area of the on-screen map with the mouse, or navigating through the map with the mouse or keyboard. The web browser 165 transmits the request via a HTTP GET method (Step A of Figure 13). For example, the request might be for a description of the objects within a rectangle whose back left corner is at 120,000 meters form the left of the landscape, 140,000 meters from the back of the landscape, and which is 300 meters in width and 130 meters in depth. In addition, the request may indicate that a maximum of 22 objects should be described. Such a request might be coded as:

http://map.net/xzwd?x=120000;z=140000;w=30;d=130;maxS=22

Alternatively, the request might be coded as:

http://map.net/xyz?x=120000;y=3800;z=140000

to request a view from the position at 120,000 meters from the left of the landscape, 3800 meters above the surface of the landscape, and 140,000 meters from the bottom of the landscape.

The request can be transmitted over the network 165 and received by the host computer 175 web server 155, and passed to the map serving software 150 for a response. As described in Figures 11A through 11G, the map serving software 150 can be configured to parse the request, retrieve the specified information from the runtime database 110 (Step B of Figure 13), and

construct the response using the XYZ Protocol via HTTP to the web browser 165 (Step C of Figure 13).

The set of XYZ Protocol tags and attributes used in the responses are in a reserved XML Namespace. The Namespace includes markup for packaging the whole transmission and for describing the X,Z,W,D region. The Namespace also includes markup for describing each object's URL, Title, Description, and coordinate position, among other things.

1. Elements of the XYZ Protocol

In one embodiment, the XYZ Protocol is made up of the following XML elements:

- **<?xml ?>**
- **<xyz> </xyz>**
- **<copyright> </copyright>**
- **<site> </site>**
- **<u> </u>**
- **<t> </t>**
- **<d> </d>**
- **<at />**
- **<cat> </cat>**
- **<ad />**

Of course, one skilled in the art could readily construct the protocol with a different selection of tags.

Each of the elements listed above will now be described:

2. The XML Element

Elements	Attributes	Meaning
<?xml ?>		Starts and ends the XML declaration.
	version=" "	Describes the version of XML being used, version must equal 1.0 as it is currently the only XML version.
	encoding=" "	Allows authors to specify the character encoding they will be using. This only needs to be used by authors that are using other encoding besides US-ASCII or UTF-8.

3. The XYZ tag

Elements	Attributes	Meaning

<xyz> </xyz>		Opening and closing elements which contains all the XML element names, attribute names and values.
	xmlns=" "	XML Name Space. This is used for declaring namespaces and giving elements a unique name. xmlns is a collection of names, identified by a URL, which are used in XML documents as elements and attributes.
	path=" "	The value of path corresponds with the map you are currently viewing.
	x=" "	The numerical value of "x" corresponds with the x co-ordinates on the map (horizontal measurements, in meters).
	y=" "	The numerical value of "y" corresponds with the height in meters you are located above the map (in meters).
	z=" "	The numerical value of "z" corresponds with the z co-ordinates on the map (vertical measurements, in meters).
	w=" "	The numerical value of "w" corresponds to the width of the entire viewable map area in meters.
	d=" "	The numerical value of "d" corresponds to the height of the entire viewable map area in meters.
	maxPC=" "	The numerical value of "maxPC" or maximum Page Count corresponds to the highest number of pages on one site.
	maxOL=" "	The numerical value of "maxOL" or maximum Out Links corresponds to the highest number of links pointing away from a particular site.
	maxIL=" "	The numerical alue of "maxIL" or maximum In Links corresponds to the highest number of links pointing to a site.
	maxG=" "	The numerical value of "maxG" or maximum graphics corresponds to the graphics intensity of a site. It is currently not in use.
	maxR=" "	The numerical value of "maxR" or maximum ratings is either 0 or 100, therefore the maximum value will be 100.

Order Number: 20530-11

4. The Copyright tag

Elements	Attributes	Meaning
<copyright> </copyright>		The copyright Statement.

5. The Site tag

Elements	Attributes	Meaning
<site> </site>		Opening and closing statements corresponding to the description of a site located on the map.
	pc=" "	Page Count he number of pages contained within the website.
	ol=" "	Out Links. The number of links pointing away from a particular site.

	il=" "	In Links. The number of links pointing to the site.
	g=" "	Graphics Intensity. The graphics complexity of the site. This attribute is currently not being used.
	r=" "	Ratings. This value with be either 0 or 100. A value of 100 deems the site a "cool site" and marks it with a star.

6. The U tag for URLs

Elements	Attributes	Meaning
<u> </u>		Opening and closing elements for the URL of a particular website.

7. The T tag for Titles

Elements	Attributes	Meaning
<t> </t>		Opening and closing elements for the title of a particular website.

8. The D tag for Descriptions

Elements	Attributes	Meaning
<d> </d>		Opening and closing elements for the description of the contents for a particular website.

9. The AT tag for locations

Elements	Attributes	Meaning
<at />		The tag corresponding to the location of a particular site on the map.
	x=" "	The numerical value of "x" corresponds to the number of meters from the left side of the map in which the site is located.
	z=" "	The numerical value of "z" corresponds to the number of meters from the top of the map in which the site is located.
	cat=' '	The numerical value for "cat" corresponds to the category in which the site is located.

10. The CAT tag for categories

Elements	Attributes	Meaning
<cat> </cat>		Opening and closing elements corresponding to the title or subject assigned to each colored square on the map.
	id=" "	The category ID number.
	x=" "	The numerical value of "x" corresponds to the number of meters from the left side of the map in which the square is situated.

	z=" "	The numerical value of "z" corresponds to the number of meters down from the top of the map in which the square is situated.
	w=" "	The numerical value of "w" corresponds to the width of the square in meters on the map.
	d=" "	The numerical value of "d" corresponds to the height of the square in meters on the map.
	depth=" "	The numerical value of "depth" corresponds to the depth of the category in the hierarchy. A top level category has depth=0.

11. The AD tag for advertisements

Elements	Attributes	Meaning
<ad> </ad>		The tag corresponding to the location of an advertisement on the map.
	cat=" "	The numerical value of "cat" determines which category the ad will be placed within on the map.
	x=" "	The "x" co-ordinate of the advertisement on the map.
	z=" "	The "z" co-ordinate of the advertisement on the map.
	ad=" "	The id of the ad to display.

12. Document Structure of the Tags

As with HTML, there is a hierarchical structure to the markup used in the XYZ Protocol. The following table shows the relationship of the tags:

Element	Follows	Contains	Contained In
<?xml ?>			
<xyz> </xyz>	<?xml />	<copyright> </copyright>	
		<site> </site>	
		<at />	
		<cat> </cat>	
		<ad />	
<copyright> </copyright>	<xyz> </xyz>		<xyz> </xyz>
<site> </site>	<copyright> </copyright>	<u> </u>	<xyz> </xyz>
		<t> </t>	
		<d> </d>	
<u> </u>	<site>		<site> </site>
<t> </t>	<u> </u>		<site> </site>
<d> </d>	<t> </t>		<site> </site>
<at />	<site> </site>		<xyz> </xyz>
<cat> </cat>	<at />		<xyz> </xyz>
<ad />	<cat> </cat>	<u> </u>	<xyz> </xyz>

13. A Sample Response

As explained above, once all of the objects and associated metadata are retrieved from the runtime database 110 for a request from a client 180, the map serving software 150 constructs the response with the above described XYZ Protocol and the response is sent through the network 160 to the client 180 via HTTP (Step C of Figure 13).

For example, the response might be:

```
<?xml version = "1.0" encoding = "UTF-8" ?>

<xyz xmlns = "http://map.net/xyzSapce" x= "2901100" y= "0" z= "355000" w= "100" d= "100"
maxPC= "46795" maxOL= "23035" maxIL= "10725" maxG= "82" maxR= "100">

<copyright>Copyright 2000 Antarcti.ca Systems Inc. </copyright>

<site pc= "2" ol= "3" il= "0" g= "0" r= "0">

        <u>http://www.io.com/~desantom/rad.html</u>

        <t>REXX Adventure Page, The</t>

        <d>A text adventure engine for OS/2 Presentation Manager.</d>

        <at x= "2901105" z= "355005" lat= "17.32.25" long= "3.42.34" cat= "34985" />

</site>

<site pc= "2" ol= "1" il= "1" g= "0" r= "0">

        <u>http://www.accessone.com/~conroy/ab.html</u>

        <t>Adventure Builder</t>

        <d>Shareware text adventure game system for Windows.</d>
```

```
        <at x= "2901165" z= "355035" lat= "17.32.24" long= "3.42.41" cat= "34985" />

</site>

<cat id= "34985" x= "2901100" z= "355000" w= "1300" d= "800"
>Games/Video_Games/Genres/Interactive_Fiction/Authoring_Systems </cat>

</xyz>
```

Such a response indicates that the subcategory to be visualized is the "Authoring Systems" subcategory. The subcategory is positioned according to the x,z,w,d coordinates of (2901100, 355000, 1300, 800). (In one embodiment, category is rendered by the client as a rectangle plot of virtual land.) Within this category, two web sites are to be displayed: (1) The REXX Adventure Page at coordinates (2901105, 355005), and (2) The Adventure Builder at coordinates (2901165, 355035). The 3D Browser Plug-In 170 parses the XYZ response and renders the objects in a 3D map (Step D of Figure 13).

VI. Example Visualizations

Figure 6B shows a 3D visualization of a portion of the information space that was rendered by a client in accordance with an XYZ Protocol response. Here, the visualization of objects 605 is shown as a house 605.1, a factory 605.2, or skyscraper 605.3, depending on the object's visibility rating. From the label "/start/arts/movies", the user can determine that she or he is viewing the "ARTS" top-level category. Visualization of subcategories 610 are the blocks of 'land' underneath the various objects. For example, the MOVIES subcategory is the land area at the foreground of Figure 6B. Visualization of metadata 615 includes in Figure 6B the object's title hovering over the object's visualized building.

VII. Conclusion

From the foregoing detailed description, it will be evident that there are a number of changes, adaptations and modifications of the present invention which come within the province of those skilled in the art. However, it is intended that all such variations not departing from the spirit of the invention be considered as within the scope thereof.

Document Retrieved from Patent Docs

What is claimed is:

1. A method for describing a plurality of objects in a map of a virtual space, the method comprising:

expressing an world position for each of the plurality of objects, where the object position defines the location of the object within the virtual space;

listing object metadata for each of the plurality of objects, where the object metadata characterizes detail information about each of the plurality of objects.

2. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of expressing a world position comprises expressing an x-coordinate and a z-coordinate of the object on the map.

3. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing how much graphical material each of the plurality of objects contains.

4. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing a title for each of the plurality of objects.

5. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing a description for each of the plurality of objects.

6. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing a page count of the number of pages contained within each of the plurality of objects.

7. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing a out-links count of the number of links pointing away from each of the plurality of objects.

8. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing a in-links count of the number of links pointing to each of the plurality of objects.

9. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing a rating for each of the plurality of objects.

10. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing a logo for a company associated to each of the plurality of objects.

11. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing contact information for a company associated to each of the plurality of objects.

12. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing an industry SIC code for a company associated to each of the plurality of objects.

13. The method for describing a plurality of objects in a map of a virtual space from claim 1, wherein the step of listing object metadata comprises listing a trading symbol for a company associated to each of the plurality of objects.

14. The method for describing a plurality of objects in a map of a virtual space from claim 1, further comprising:

designating at least one category for the map, where the step of designating comprises:

listing category metadata for each of the categories, where the category metadata discloses detail information about each of the categories; and

defining a category bounds on the map for each of the categories.

15. The method for describing a plurality of objects in a map of a virtual space from claim 14, wherein the step of defining a category bounds comprises defining an x-coordinate, a z-coordinate, a width-coordinate, and a height-coordinate for the category.

16. The method for describing a plurality of objects in a map of a virtual space from claim 14, wherein the step of listing a category metadata comprises listing a category identifier.

17. The method for describing a plurality of objects in a map of a virtual space from claim 14, wherein the step of listing a category metadata comprises listing a depth identifier for describing a hierarchical depth of the category.

18. The method for describing a plurality of objects in a map of a virtual space from claim 1, further comprising:

defining a map bounds, for describing what portion of the virtual space is shown by the map; and

listing map metadata, for describing detail characteristics of the map.

19. The method for describing a plurality of objects in a map of a virtual space from claim 18, wherein the step of expressing a map bounds comprises defining an x-coordinate, a z-coordinate, a width-coordinate, and a height-coordinate for the map.

20. The method for describing a plurality of objects in a map of a virtual space from claim 18, wherein the step of listing a category metadata comprises listing a maximum page count corresponding to the highest number of pages for any of the objects.

21. The method for describing a plurality of objects in a map of a virtual space from claim 18, wherein the step of listing a category metadata comprises listing a maximum out-links corresponding to the highest number of links pointing away from any of the objects.

22. The method for describing a plurality of objects in a map of a virtual space from claim 18, wherein the step of listing a category metadata comprises listing a maximum in-links corresponding to the highest number of links pointing to any of the objects.

23. The method for describing a plurality of objects in a map of a virtual space from claim 18, wherein the step of listing a category metadata comprises listing a maximum rating for any of the objects.

24. The method for describing a plurality of objects in a map of a virtual space from claim 18, wherein the step of listing a category metadata comprises listing a metadata range, where the metadata range is the minimum value of the metadata or the maximum value of the metadata for any of the objects.

25. The method for describing a plurality of objects in a map of a virtual space from any one of the previous claims, wherein the plurality of objects are URLs.

26. The method for describing a plurality of objects in a map of a virtual space from any one of the previous claims, wherein XML protocol is used to describe the plurality of objects in the map of the virtual space.

27. The method for describing a plurality of objects in a map of a virtual space from claim 26, wherein XML namespaces are used to enable extension of XML protocol.

METHOD FOR DESCRIBING OBJECTS IN A VIRTUAL SPACE

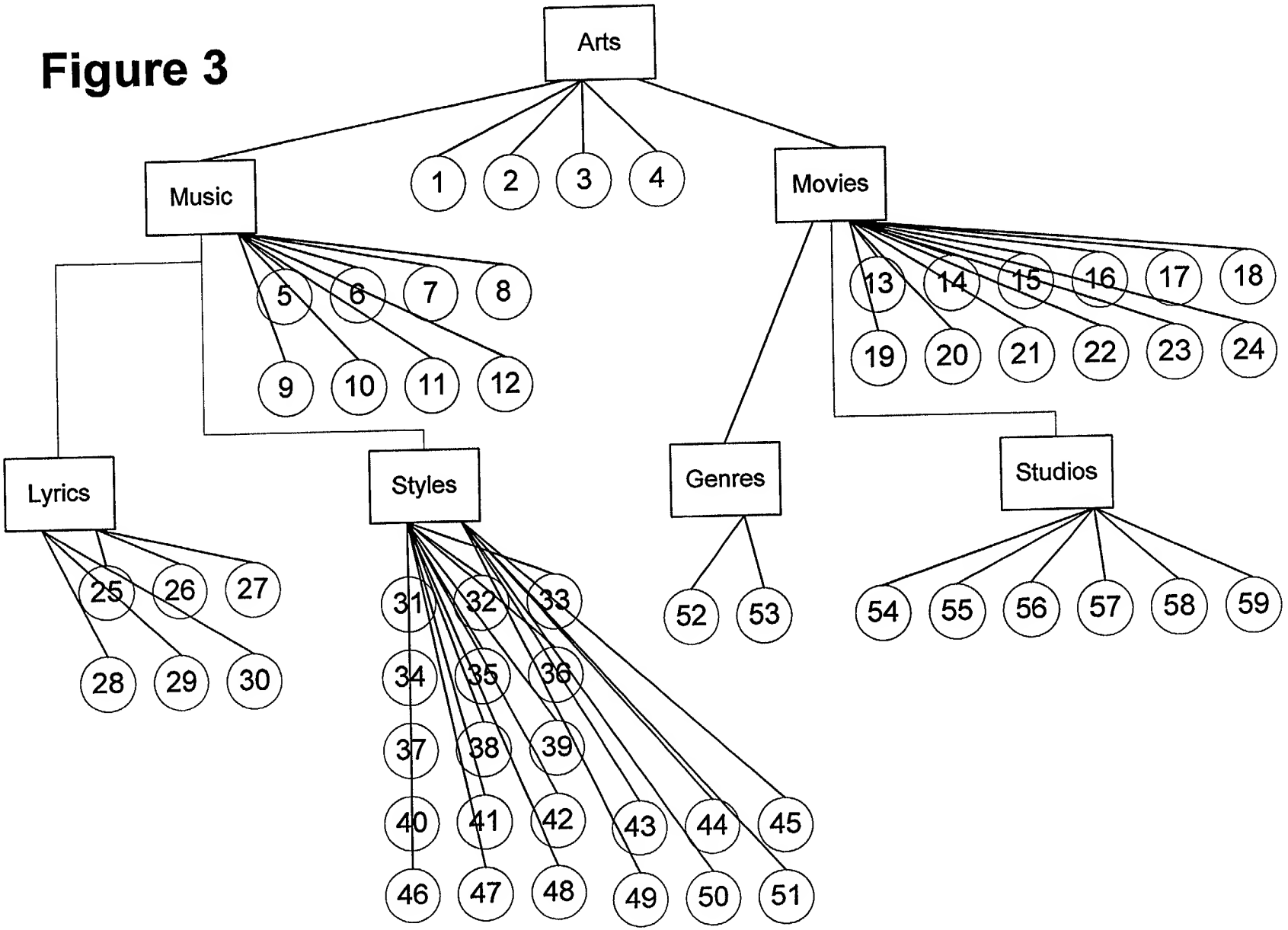
ABSTRACT OF THE DISCLOSURE

A method for describing objects in a virtual space. In one embodiment, each object is a URL, which has been assigned to a system of hierarchical categories. The objects have been mapped to a map region, each object having been given a location within the map region. Each category within the map region is defined as a polygon area covering all of the category's objects as well as all of the category's subcategories. A client computer can request a portion of the map to be visualized. A host computer receives the request and retrieves the appropriate objects and categories from a database. The host computer forms the response to the request using a protocol which describes facts, location, and metadata about the objects and categories. The encoded response is delivered to the client. The client decodes the response and renders the objects and categories for the user. Different types of clients can concurrently request object descriptions from the server.

Express Mail Label No. EL 707 650 705 US

DONTT thsETZ60

Figure 3



DRAFT - 08/27/2003

Figure 4

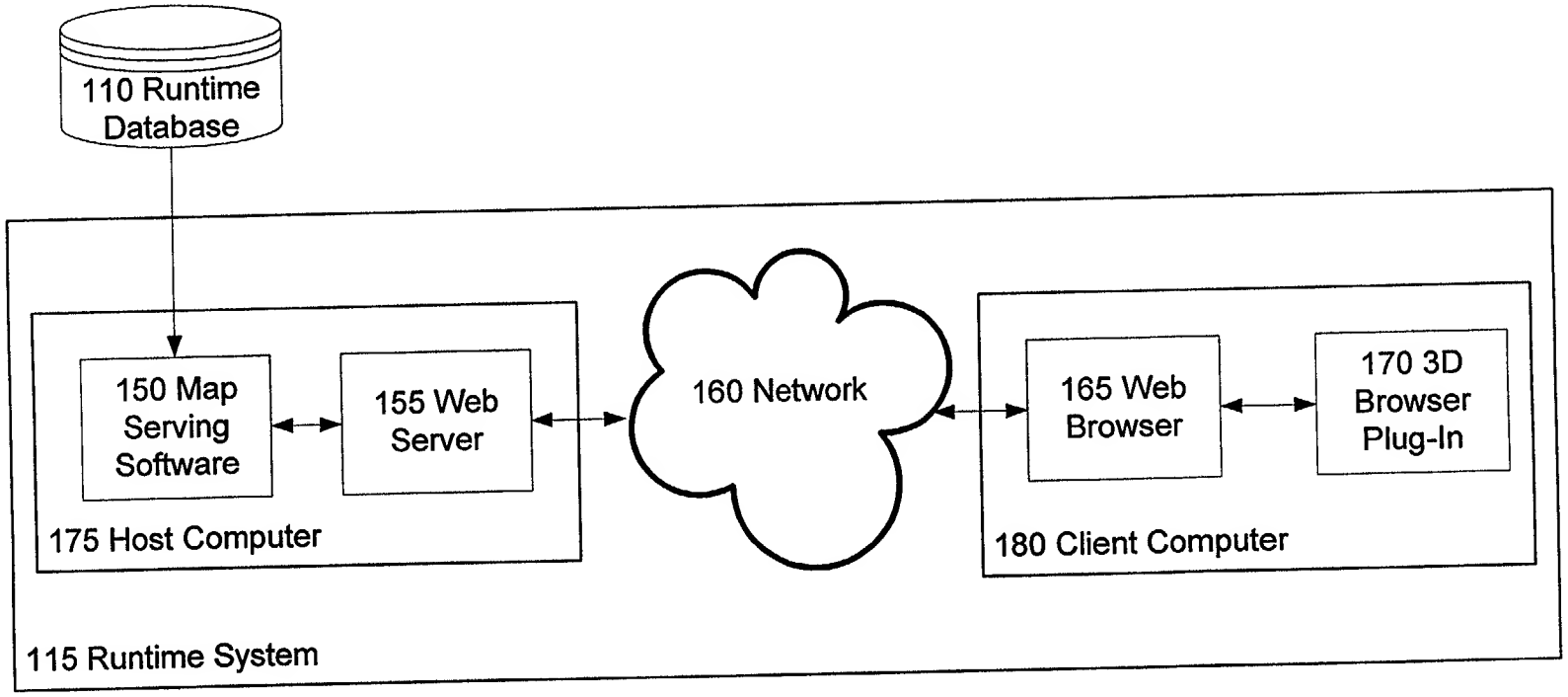


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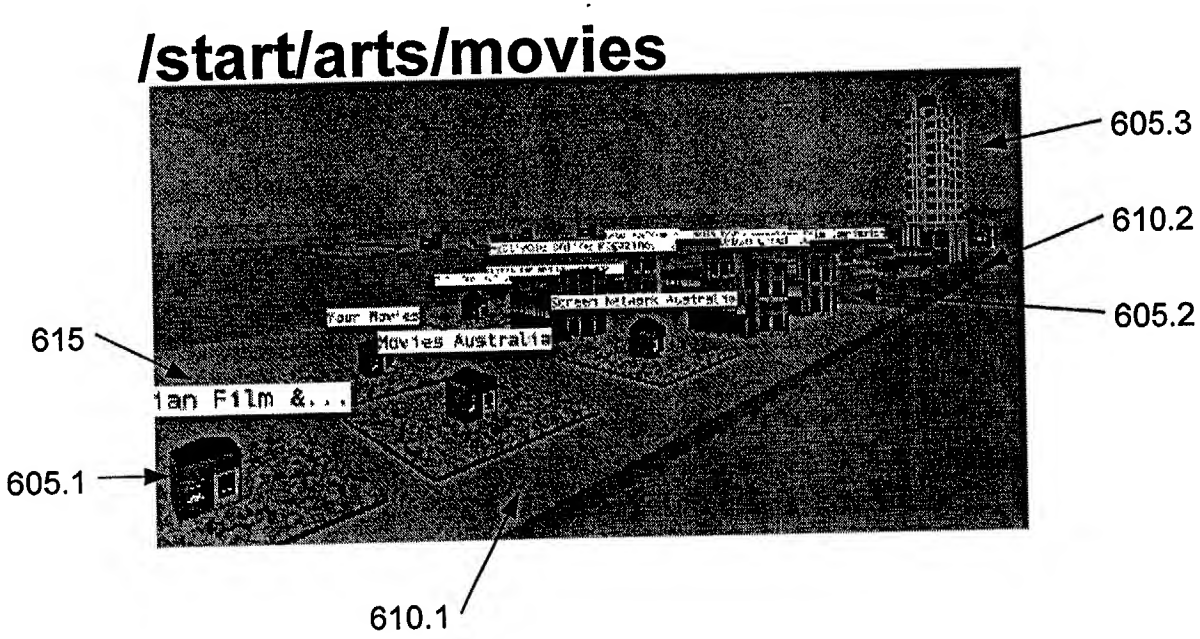
Figure 6B - Three Dimensional Visualization



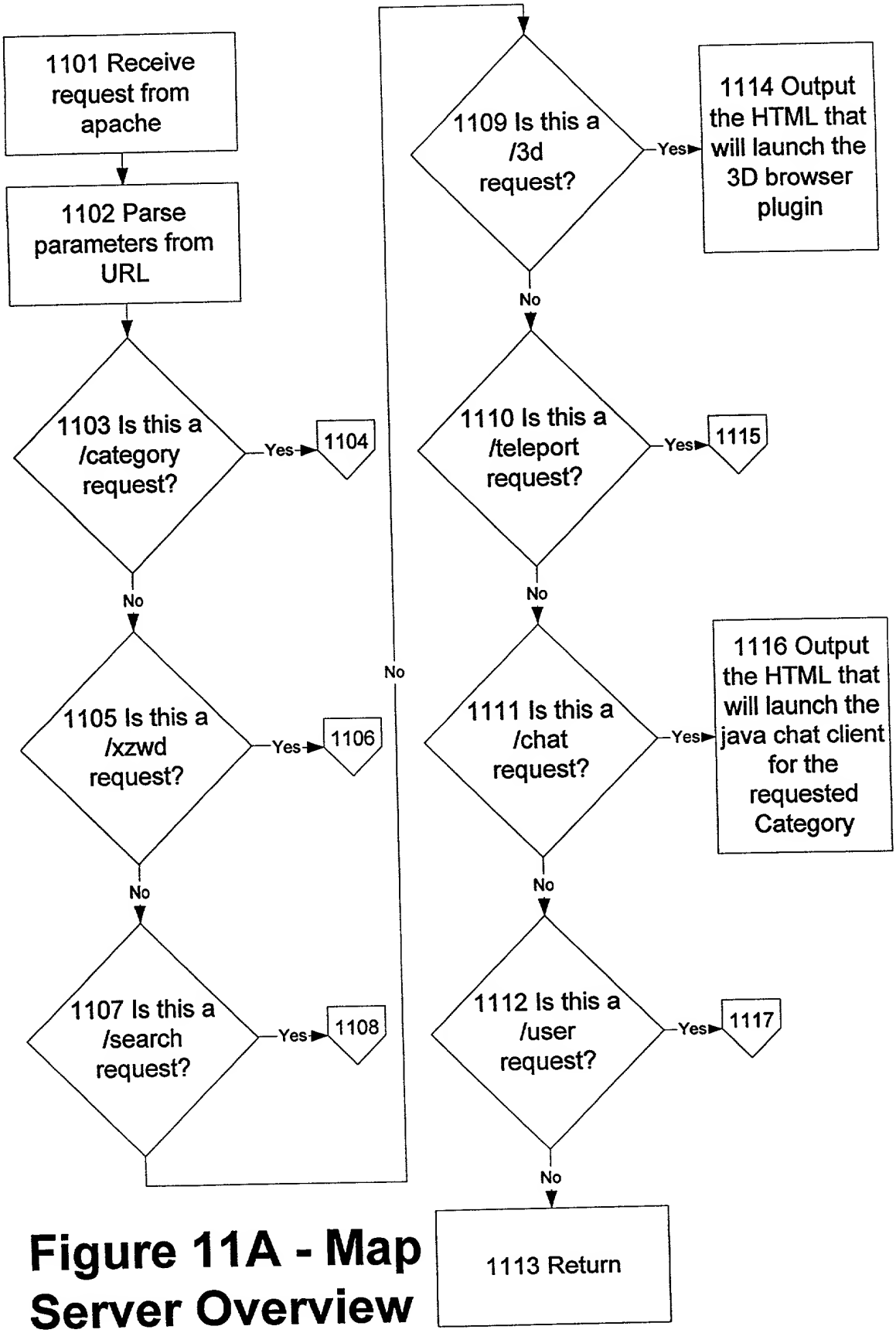


Figure 11A - Map Server Overview

FIGURE 11B - /category Handler

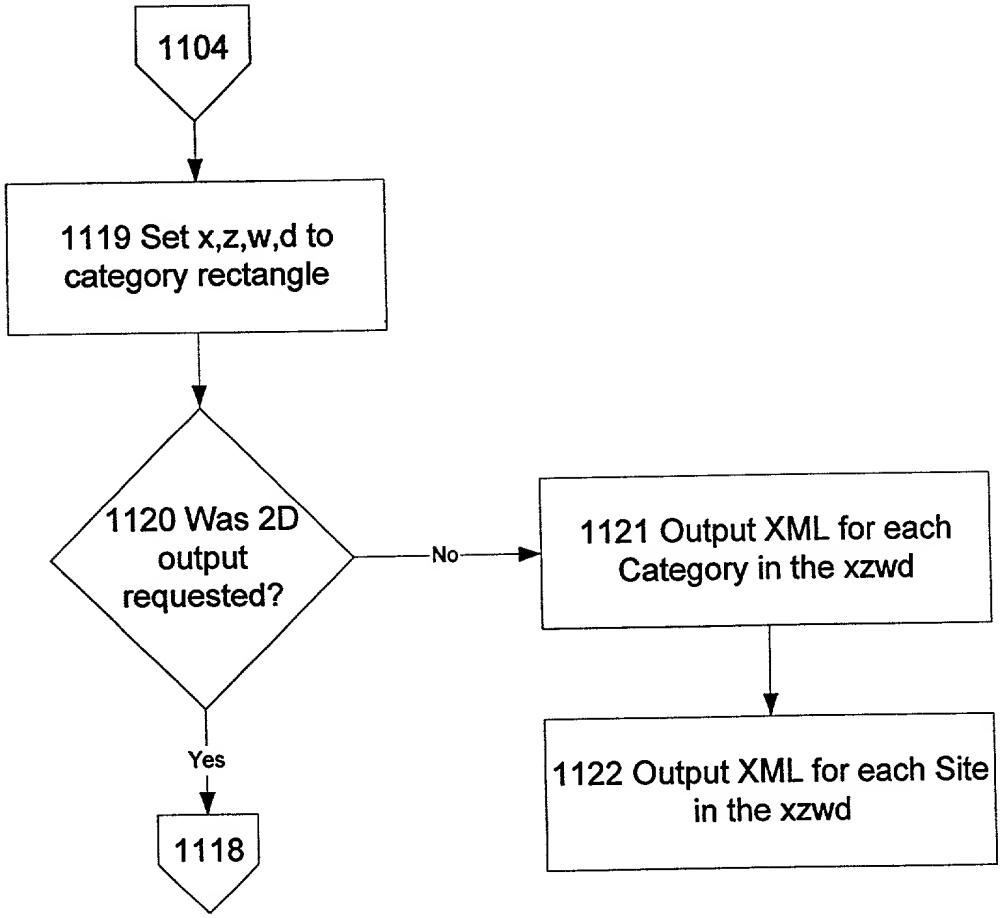
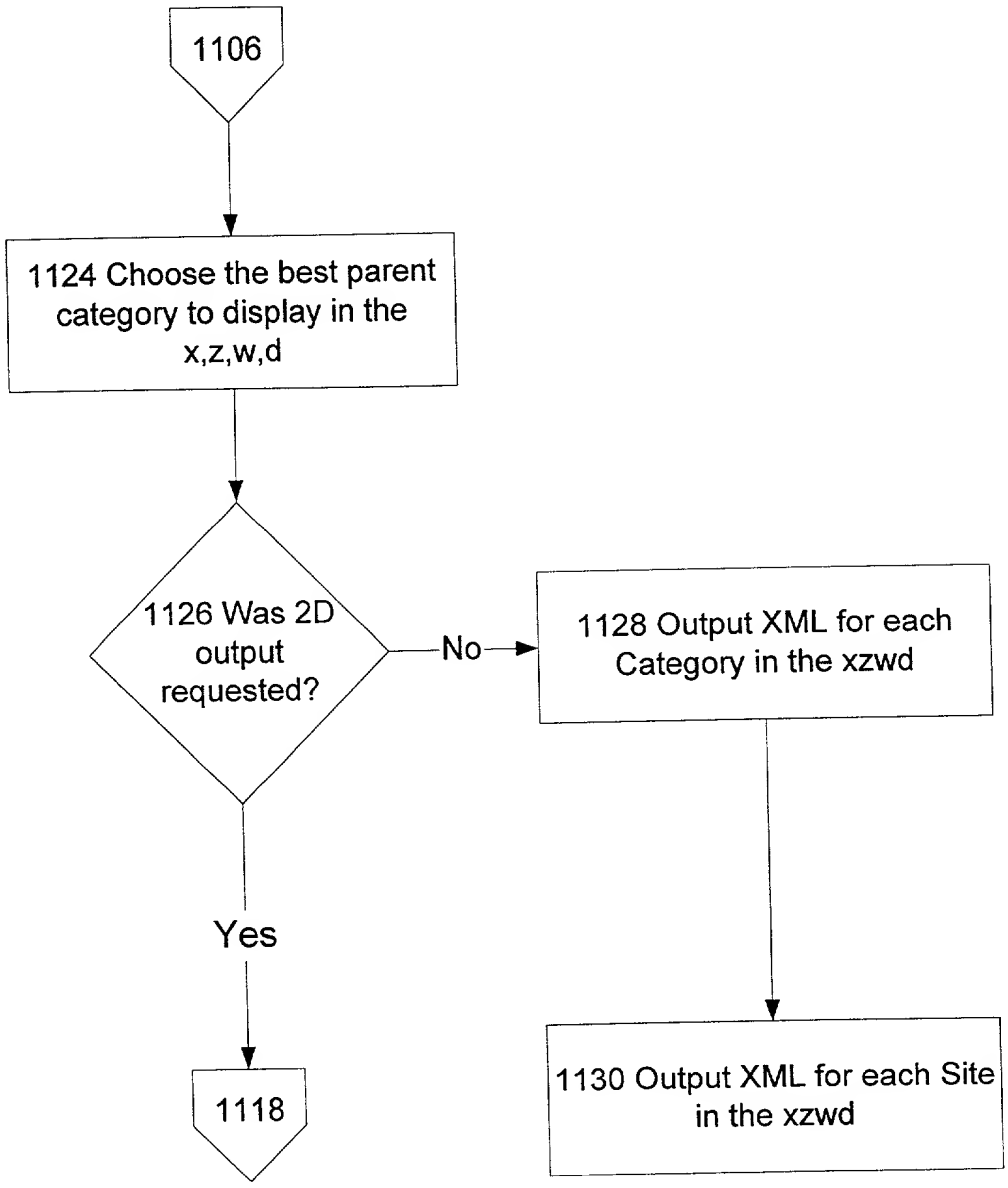


FIGURE 11C - /xzwd Handler



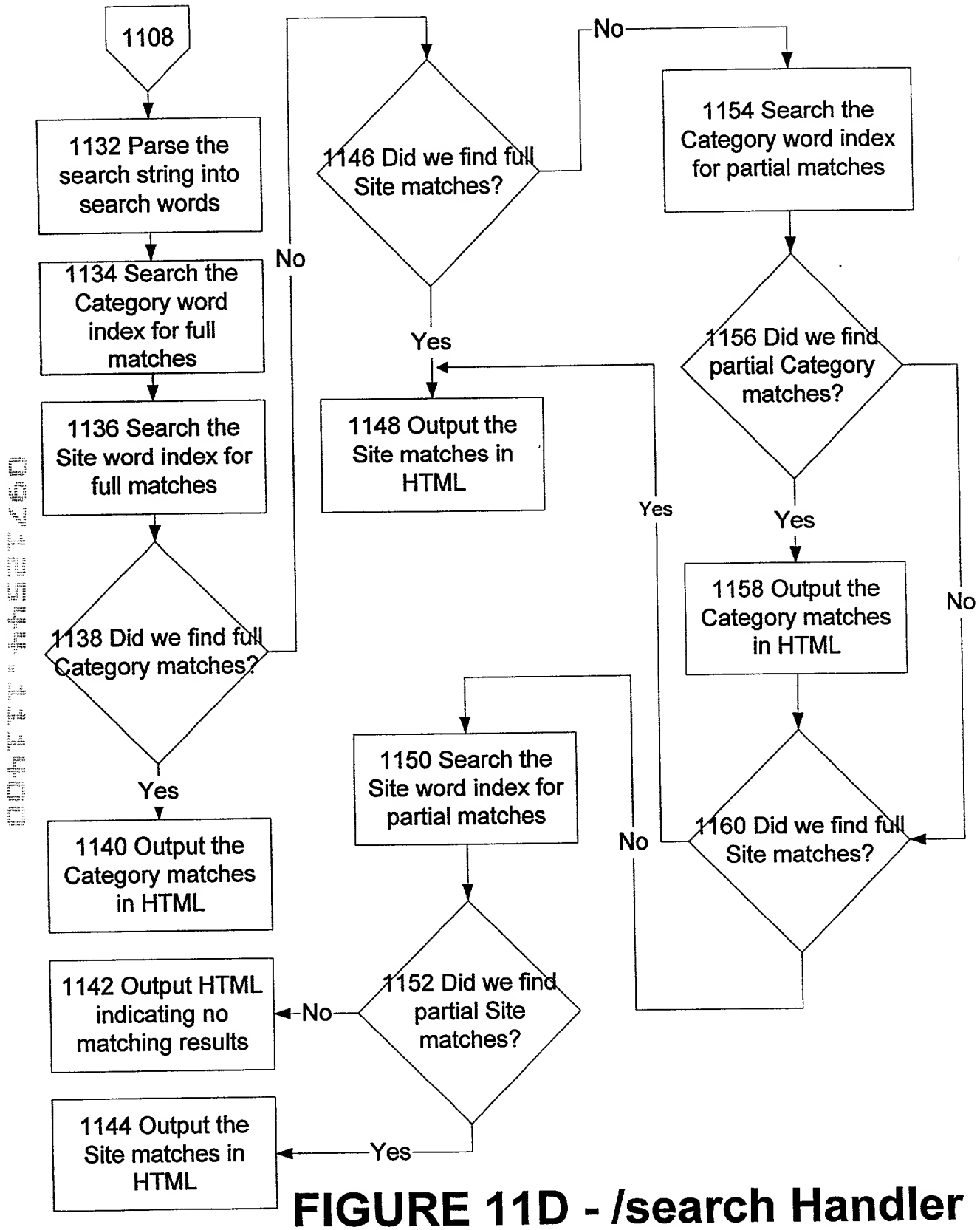


FIGURE 11D - /search Handler

FIGURE 11E - /teleport Handler

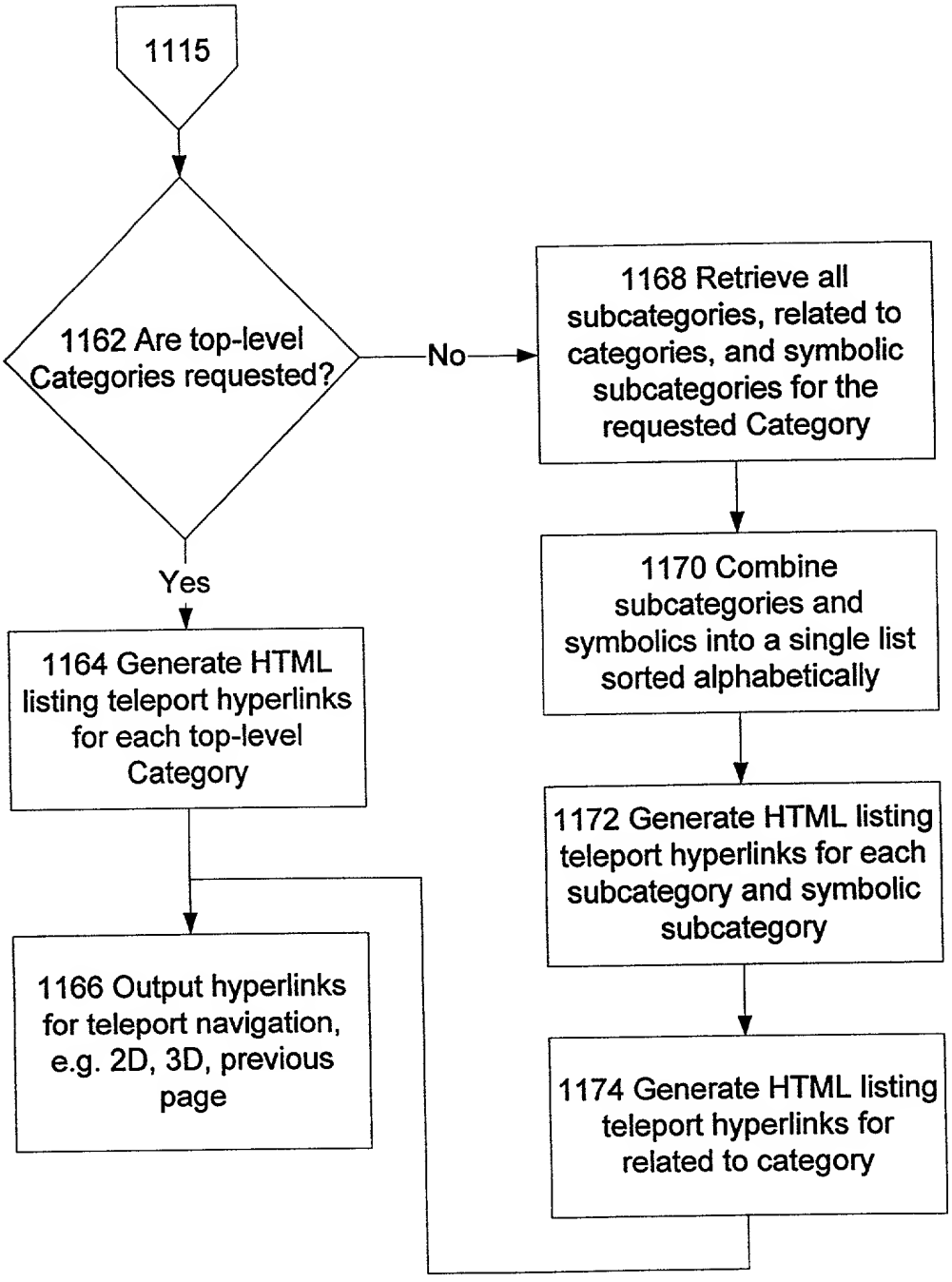


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FIGURE 11F - /user Handler

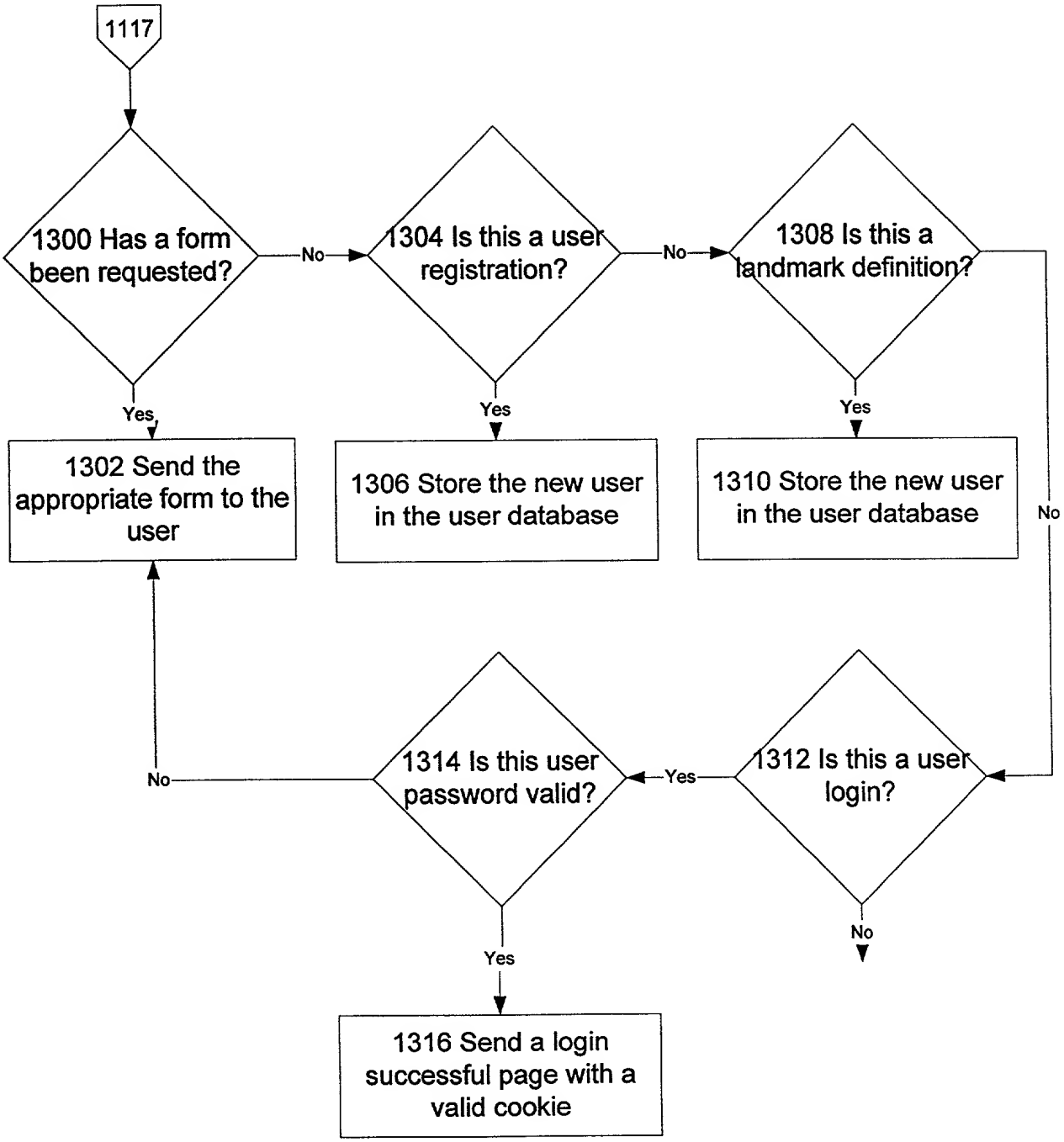

FIGURE 11G - Show Map in 2D

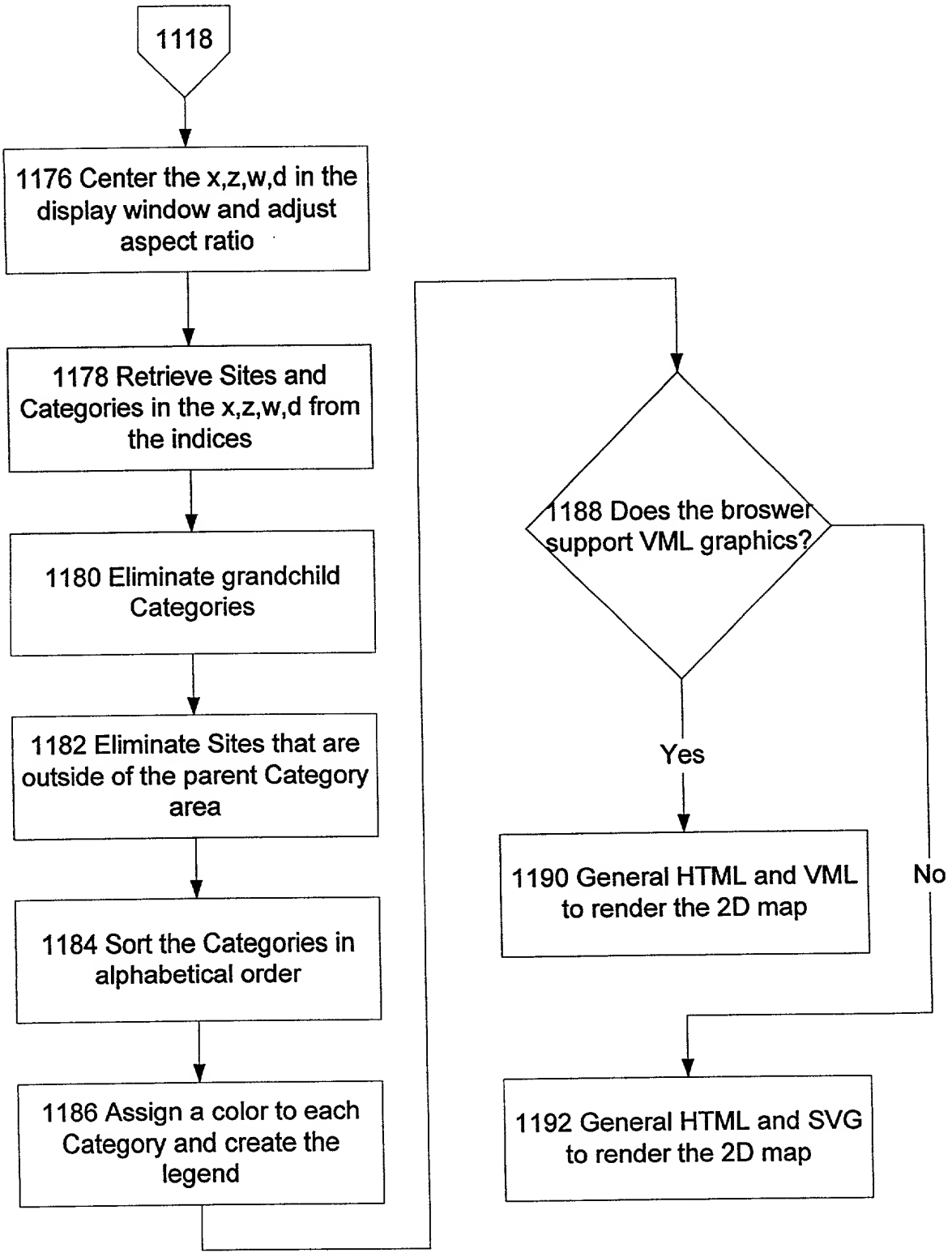

Figure 12A - 3D Browser Plug-in

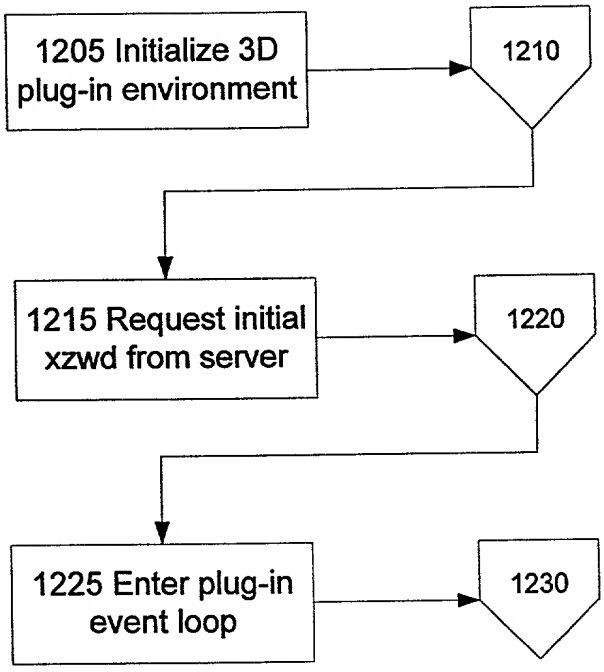

Figure 12B - Request xzwd From Server

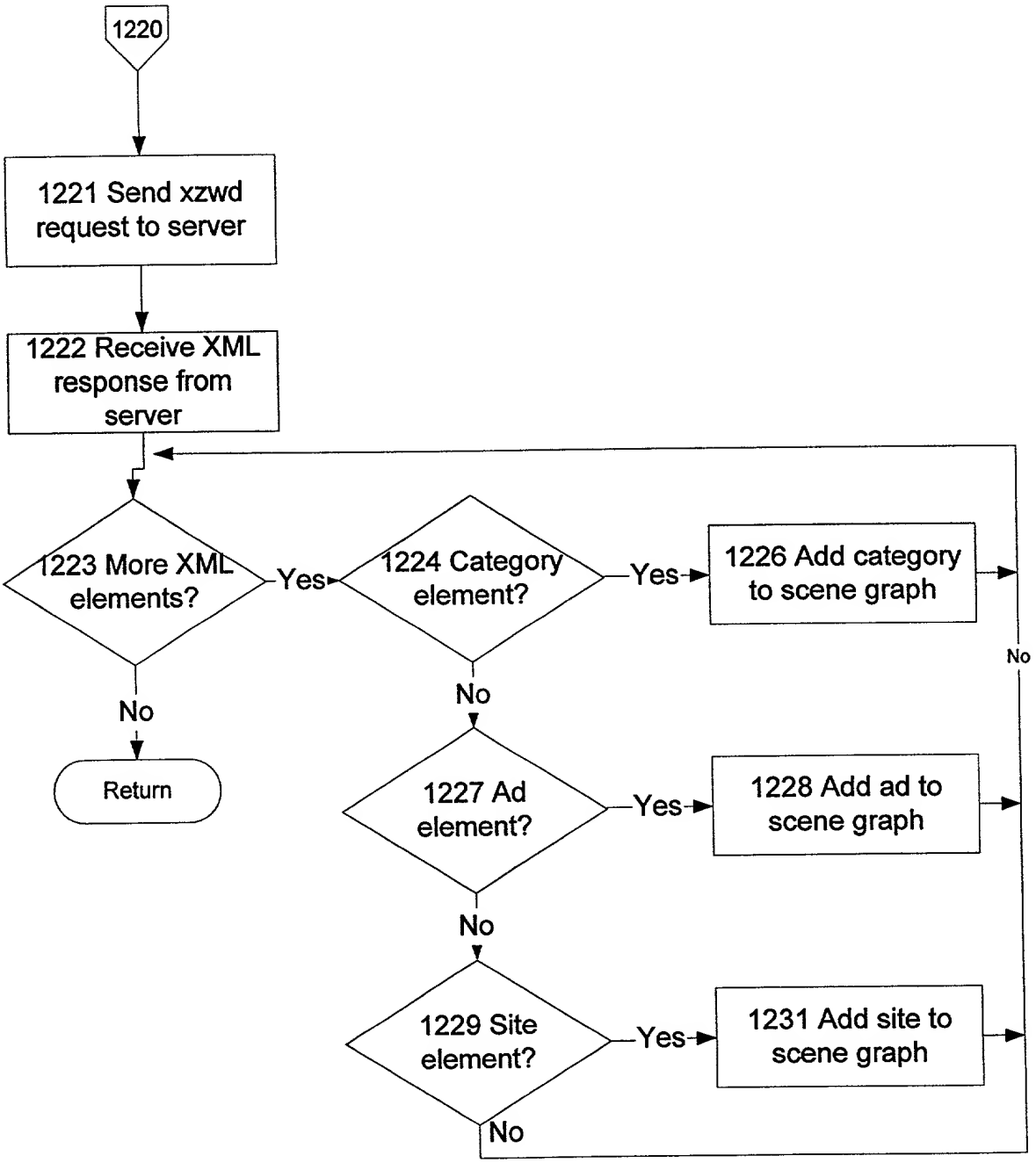

Figure 12C - Plug-in Event Loop

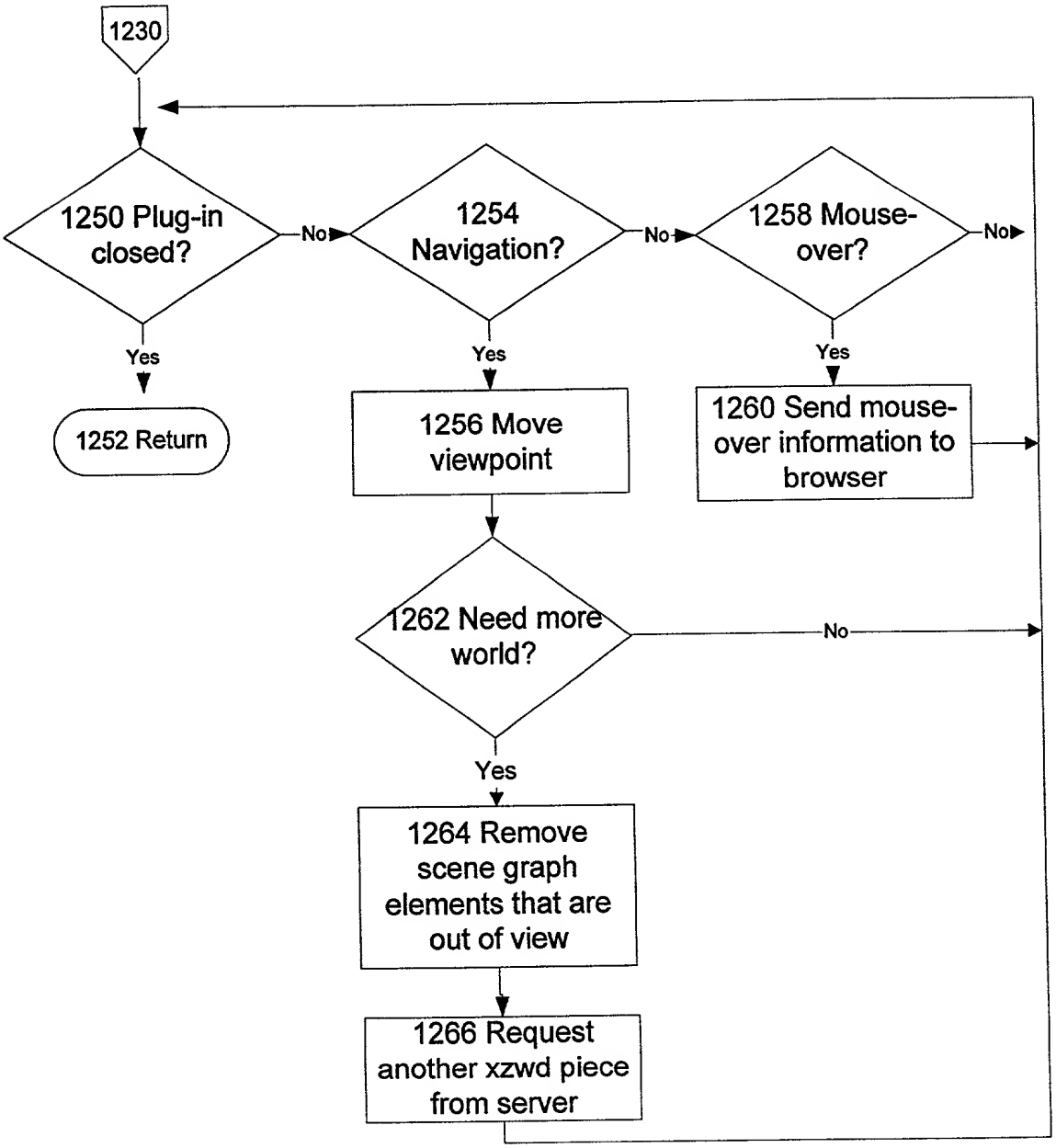

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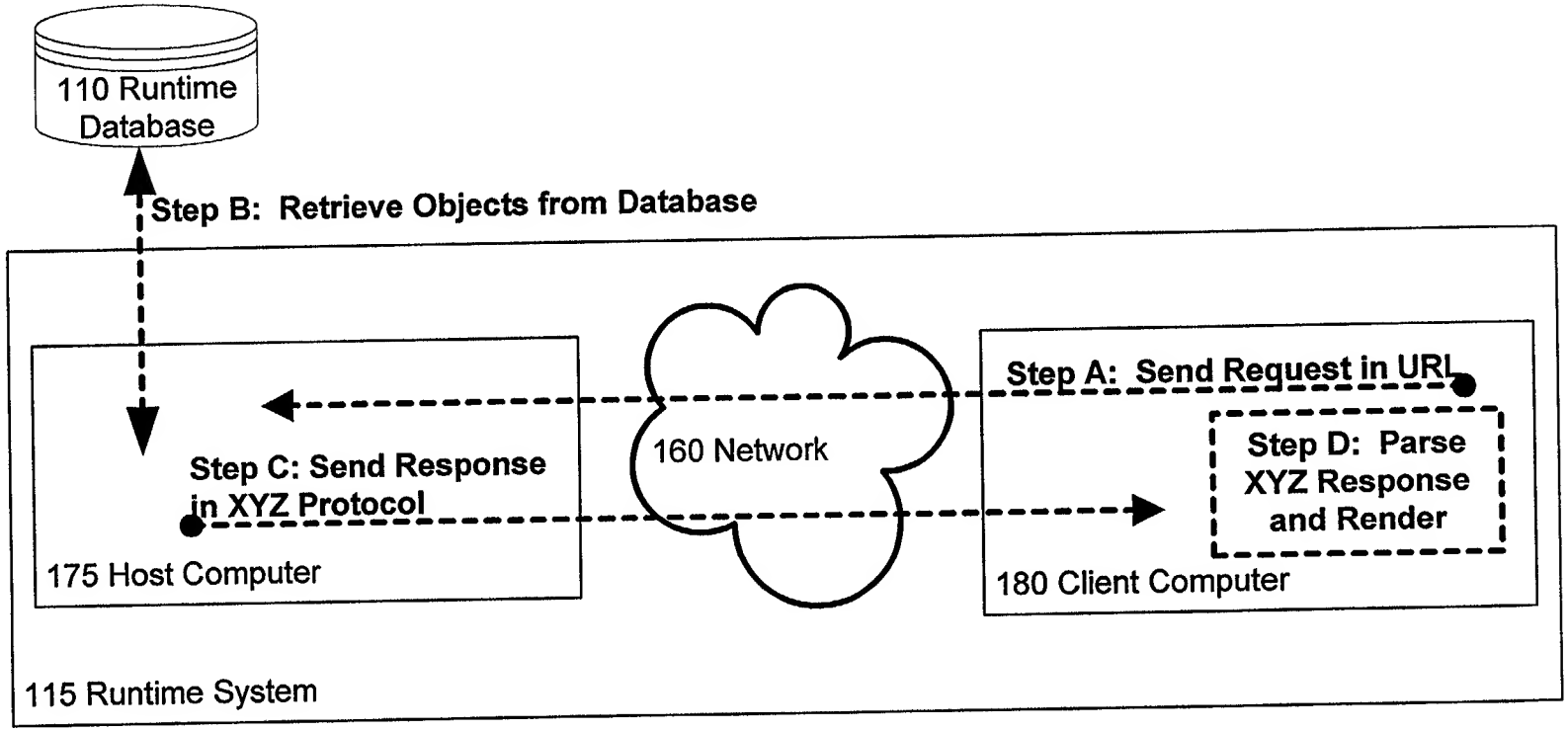
Figure 13 - Request and Response Illustration



DECLARATION AND PETITION

As a below named inventors, We hereby declare that:

Our residence, post office address and citizenship are as stated below next to our names.

We believe we are the original, first and joint inventors of the subject matter which is claimed and for which a patent is sought on the invention entitled "Method for Describing Objects In A Virtual Space," the specification of which is attached hereto.

We hereby state that we have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

We acknowledge the duty to disclose information which is material to the examination of this application in accordance with 37 C.F.R. § 1.56(a).

We hereby claim foreign priority benefits under 35 U.S.C. § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application of which priority is claimed.

PRIOR FOREIGN APPLICATION(S)

Number	Country	Filing Date	Priority Claimed?
NONE			

We hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 U.S.C. § 112, We acknowledge the duty to disclose material information as defined in 37 C.F.R. § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATION(S)

Application Serial No.	Filing Date	Status
60/232,213	September 13, 2000	Provisional
60/232,284	September 13, 2000	Provisional

We hereby declare: All statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true. These statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

DOCKET ALARM

Wherefore we pray that Letters Patent be granted to us for the invention or discovery described and claimed in the foregoing specification and claims, and we hereby subscribe our names to the foregoing specification and claims, and this declaration and petition.

Full name of sole or first inventor Tim W. Bray

Inventor's signature _____ Date Nov 10/2000

Residence: Vancouver, British Columbia, Canada

Citizenship: Canadian

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DOCKET NO. 20530-11

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Bray et al.	
Serial No	: Not yet assigned	
Filed	: Herewith	Group Art Unit: Not yet assigned
Title	: METHOD FOR DESCRIBING OBJECTS IN A VIRTUAL SPACE	Examiner: Not yet assigned
Docket No	: 20531/11	

POWER OF ATTORNEY

We hereby appoint the following attorneys to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

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